

Antimicrobial efficacy testing of antibiotic-containing biodegradable nanopolymers against biofilm and planktonic cells

Polimyr Caesar Dave P. Dingal

Literature Review



```
graph TD; A[Literature Review] --> B[Antibiotic therapy]; B --> C[Biofilm characteristics]; C --> D["P. aeruginosa & E. coli"]; D --> E[Nanosystem drug delivery]; E --> F[PMMA & PLGA]
```

Antibiotic therapy

Biofilm characteristics

P. aeruginosa & *E. coli*

Nanosystem drug delivery

PMMA & PLGA

Literature search methods



Databases

- Scopus
- ScienceDirect



Initial Readings

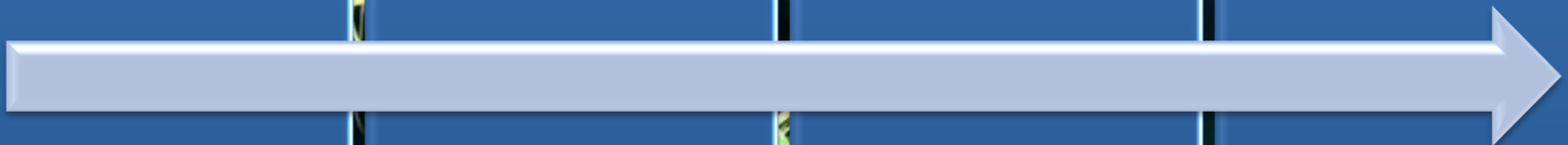


Direct quotation

- through other journal articles



Idea Fillers



Literature findings

Antibiotic Therapy

- Conventional tests on planktonic cultures
- Multi-resistant pathogens

Biofilm characteristics

- Increased antibiotic tolerance
- Alginate matrix; persister cells

P. aeruginosa

- Cystic fibrosis – hypoxic environ
- Rethinking of clinical tests to against anaerobic and biofilm mode

E. coli

- Extraintestinal pathogen, food contaminant
- Most widely studied bacteria model

Nanosystem delivery

- Biocompatibility, sustained delivery, matrix penetration
- Micelles, liposomes, nanoparticles, etc.

PMMA & PLGA

- Nanoparticles for intracellular drug/gene delivery
- Antibiotic applications scarce

Biosafety Issues and Techniques

- General SCBE Biosafety Policy

<http://www3.ntu.edu.sg/SCBE/Forms/SAFETY%20MANUAL.pdf>

- Emphasis on the following:

- Appropriate attire and accessories
- Aseptic techniques (isolation, disinfection, decontamination procedures)
- Wash with antibacterial soap before/after work
- Proper disposal of biohazards (autoclave, biohazards bag)

Basic Microbiology Techniques

Aseptic techniques

Serial dilution method

Culturing

- Quadrant streak method
- Bacterial identification

Statistical analysis

Quantitation techniques

- Cell counting
- Biofilm characterization

Experimental Procedures

Bacterial Growth Kinetics

- Temporal counting of viable biofilm and planktonic cells
- Monitors growth phase used for testing; consistency of CBD biofilms forms

Optimize Biofilm Formation

- Tweaking of various growth parameters: growth medium, incubation temperature & time, flow conditions, anaerobic or aerobic
- Biofilm quantitation methods

MBEC and MIC Assays

- As per procedure by Innovotech, slight changes
- Exposure to both free and polymer-conjugated antibiotics

Drug Release Kinetics

- Characterise temporal concentration release
- Method: Dialysis bag, HPLC quantitation

Mechanism of Bacterial Eradication



THANK YOU